DOCUMENT RESUME

ED 247 053 RC 014 836

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TITLE Computer-Aided Instruction in Education Basics for Indian Students. Proceedings of the Indian Education Conference (Orem, Utah, June 28-30, 1984).
INSTITUTION Indian Affiliates Inc., Orem, UT.
SPONS AGENCY Department of Education, Washington, DC.
PUB DATE Jun 84
GRANT G-0082-0-1452
NOTE 41p.; For related documents, see RC 014 834-837.
PUB TYPE Collected Works - Conference Proceedings (021) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Alaska Natives; *American Indian Education; American Indians; Basic Skills; *Computer Assisted Instruction; Elementary Education; *Mathematics Instruction; Problem Solving; Program Content; *Program Design; *Reading Comprehension; *Word Recognition

ABSTRACT

A 3-phase project to adapt, develop, and evaluate computer-aided instructional materials in elementary education basics (specifically word recognition, reading comprehension, and mathematics) for Alaska Native and American Indian students included in its design and planning phase a conference with project staff and six nationally recognized experts in Indian education to solicit views on the promises and problems of introducing computer-based instruction for Indian populations. Experts included Mr. Robert K. Chiago, Dr. Douglas C. Garbe, Ms. Jean Mead, Dr. Kenneth R. Sumpter, Mr. V. Lynn Tyler, and Dr. Henrietta V. Whiteman. The conference activities included extensive discussion and review of the computer materials as well as written submissions from the panelists. Discussion focused on nine areas: student/computer concerns, teacher/computer concerns, community/computer concerns, parent/computer concerns, administrative/computer concerns, content specifics, problem solving approaches and real life skills, use of computer features and final report specifics. Five major themes appearing in the written comments of the panelists were: strengths and limitations of computers used in instruction; the value of a problem solving approach; need for a multi-cultural approach; content specifics; and ongoing support. (NEC)

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Conference Summary
on
Computer-Aided Instruction
in
Education Basics for Indian Students

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with

Robert K. Chiago
Douglas G. Garbe
Jean Mead
Kenneth R. Sumpter
V. Lynn Tyler
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U.S. Office of Education

Grant No. G-0082-0-1452

Indian Education Conference, held in Orem, Utah, June 28-30, 1984.

Indian Affiliates Incorporated

Orem, Utah

RC014836

Conference Summary

Indian Affiliates Incorporated is to adapt, develop, and evaluate computer-aided instructional materials in elementary education basics, specifically word recognition, reading comprehension, and mathematics for Native American, Native Alaskan, and American Indian students. The benefits of computer-aided instruction have been widely noted and well documented in the research literature. Most important for populations of American Indian students are the benefits of easy replication (materials that work in one setting can easily be transported and made to work in another setting), the perceived culture fairness of materials presented and judged by a computer, the extensive individualization capabilities of computers to tailor materials specifically and in detail for individual students, the ability of computer-aided materials to successfully and substantially improve student achievement independent of the abilities and interests of the classroom teachers whose students are using them, and the capability of computer-aided materials to produce relatively standardized enhanced levels of student achievement for geographically dispersed populations of students.

This project is to be completed in three phases. Phase I began 1 October 1982 and has lasted for 9 months. This phase was for project design and planning. One of the most significant and valuable activities in this phase of the project was a conference held by project staff with six nationally recognized experts in Indian education. There were three primary purposes of this conference: (1) to familiarize the panel of experts with the potentialities of computer-based instruction for populations of Indian children; (2) to describe to the panel progress and plans thus far under this project; (3) to solicit and encourage commentary from the panel concerning their views on the promises

and problems of introducing computer-based instruction for Indian populations and on specific directions this project ought to take.

Indian Affiliates was pleased to obtain the services of six outstanding educators, who have specialized in Indian education, to assist in performing a formative evaluation of IAI's first nine-month effort under the three-year grant. The six persons included Mr. Robert K. Chiago, Dr. Douglas G. Garbe, Ms. Jean Mead, Dr. Kenneth R. Sumpter, Mr. V. Lynn Tyler, and Dr. Henrietta V. Whiteman. A summary vita of each follows:

Mr. Robert K. Chiago has served as the Director of Native American Studies at the University of Utah for the past eleven years. Prior to this assignment, Mr. Chiago was Director of the Division of Education for the Navajo Tribe, Director of the Ramah Navajo High School at Ramah, New Mexico, and Associate Director of the American Indian Culture Center at the University of California at Los Angeles. Prior experience includes serving as a proposal reader for Indian Education Programs in the Department of Education and the National Institute of Education, and as a consultant to the Southwest Resource and Evaluation Center, Weber State College, Navajo Area School Board Association, Saint Lawrence University and Tuba City Public School District. Mr. Chiago's experience also encompasses a variety of Indian-related activities: Chairman, Utah State Board of Indian Affairs; member, Equal Opportunity Commission; member, Utah State ESEA Title IV Advisory Council; member, Title IV Parent Committee.

Dr. Douglas G. Garbe is currently a Professor of Mathematics at Brigham Young University where he teaches predominately Indian math classes. Dr. Garbe's doctoral dissertation, written at the University of Texas, was

entitled, "Indians and Non-Indians of the Southwestern United States; Comparison of Concepts for Selected Mathematics Terms." Dr. Garbe has taught Indian mathematics teachers on both the Navajo and Ute reservations. In all he has thirteen years experience developing and teaching college mathematics classes designed to help American Indian students succeed in math. Dr. Garbe is a nationally-recognized authority in the areas of mathematics vocabulary and the culturally different student, and is frequently cited in Indian education research work.

Ms. Jean Mead is the Principal of the Rock Point Community School, a bilingual/bicultural contract school, on the Navajo Nation. Ms. Mead concurrently serves as an instructor at the Navajo Community College at Tsaile. She had previously taught science at the Rock Point Community School for several years. Prior to joining the faculty at Rock Point, Ms. Mead was involved in teaching, curriculum development and teacher training in the developing countries of Lesotho and Nepal for a period of five years. She is a second language learner of Nepali, Sesotho, and Navajo. She has been extensively involved in developing, coordinating, and conducting in-country training in cross-cultural awareness.

Dr. Kenneth R. Sumpter is a Professor of English and Multi-cultural Education at Brigham Young University. His emphasis in applied linguistics research has been to enhance Native American communication skills in English. Dr. Sumpter is well known for his abilities in the fields of both psycholinguistics and sociolinguistics. He has taught primarily in the Indian Programs at the University of Utah and Brigham Young University for the past 19 years. Dr. Sumpter has served as a consultant to the San Juan School District (Utah) in organizing and implementing an off-campus program to qualify Indians as

teachers and teacher-aids; served as a consultant to the Uintah-Oray Utes at Fort Duschene (Utah) for eight years in developing their teacher development program; and consulted with Snow College in developing their program of Indian education.

Mr. V. Lynn Tyler currently coordinates research and resource services of the Center for International and Area Studies at Brigham Young University. The Center specializes in intercultural education, training, research, and development, as well as in promotion and application of new technologies. For nine years prior to this assignment, Mr. Tyler was Associate Director of the Language and Intercultural Research Center. He has served for several years on the Board of Directors of the American Translators Association and as Chairman of the Liaison and By-Laws Revision Committees of the International Communication Association. For the past four years Mr. Tyler has been Co-Chairman of the SIETAR Strategic Policy and Planning committee. He is nationally recognized as a multicultural curriculum developer. For several years he has been General Editor for the CulturGram and InfoGram series. Mr. Tyler has well over 100 publications to his credit. Comprehensive studies under his direction have involved over 500 languages and 150 country cultures.

Dr. Henrietta V. Whiteman, an enrolled full-blooded member of the Cheyenne-Arapaho Tribes of Oklahoma, is serving as Director/Professor of Native American Studies at the University of Montana at Missoula. Dr. Whiteman has held this position for the past eleven years, advancing in rank from an Assistant Professor. Previous responsibilities have included: Director and Visiting Lecturer, American Indian Program in the Graduate School of Education, Harvard University; Lecturer, California State College, Hayward;

Lecturer, Stanislaus State College, Turlock, California; Lecturer and Coordinator, Native American Studies, University of California, Berkeley; and Secondary Teacher of English and Reading. Dr. Whiteman has been listed in nine Who's Who biographies, including Marquis Who's Who of American Women. She is the author of scores of multi-cultural education-related publications. She is a frequent speaker on Indian education and reader of Title IV proposals to the U.S. Department of Education.

The conference was held over a three day period, 28-30 June 1983. The agenda for the conference is attached as Figure 1. As the agenda shows, the activities of the conference included both extensive discussion and review of the computer materials as well as written submissions from the panelists. It is notable that the approximately three hours scheduled for hands-on review of the computer materials stretched into about five hours, and required members of the panel to interact with the computer exactly as students and teachers do. This review turned out to be most valuable in demonstrating the strengths and promise of computer-based instruction to the panel and in providing feedback to the project staff.

The remainder of this conference report is divided into four sections. The first section summarizes the discussions that were held periodically throughout the conference. The second section lists points of agreement and consensus reached by the panel in a wrap-up session at the end of the conference. The third section provides a summary of the panelists' written comments. The written comments of the panelists are attached as Appendix A. The fourth section is simply a brief final word on the conference.

Indian Education Conference

June 28-30, 1983

June 28

9:00 - 10:00	Welcome and background information
10:15 - 12:00	Demonstration by staff of Reading, Math, and Learner Profile
12:00 - 1:45	Lunch as a group
2:00 - 5:00	Discussion of draft report

June 29

9:00 - 10:45	Hands-on review of Reading Curriculum
11:00 - 12:00	Discussion of applicability of Reading Curriculum
12:00 - 1:00	Lunch (participants' choice)
1:15 - 3:00	Hands-on review of Math Curriculum
3:15 - 4:00	Discussion of applicability of Math Curriculum
4:00 - 5:00	Group review and discussion of Learner Profile

June 30

9:00 - 10:45	Discussion of conference report
11:00 - 12:00	Observation of Indian students in computer room
12:00 - 1:45	Lunch (Review of CulturGram Process)
2:00 - 5:00	Drafting of conference report

Figure 1. Agenda for the Conference.

Periodic Discussion

There were four occasions during the conference when an opportunity was provided for the panelists to engage in extensive and substantive interchanges with the project staff. The following comments summarize this discussion in nine areas.

1. Student/Computer Concerns There was a general agreement that, while the procedural helps that are now available in the curriculum materials are both appropriate and valuable, there was a great need for more of them. Particularly, special lessons that focus on the procedures needed for student/computer interaction should be developed and provided as well as off-line materials suitable for use by Indian students, computer room proctors, and classroom teachers. Some effort should also be made to focus students' attention on the on-line directions and procedural helps that are now made available. Having the students learn to read and follow directions will be an important instructional gain in its own right.

   The issue of cultural relevance arose frequently during the discussions. It was agreed that it would be impossible to design all the computer materials to meet the cultural needs of all the students. However, the desirability of making some effort in this direction to show empathy with the student's difficulties in dealing with the culture of the materials was repeatedly emphasized for its significance.

   Feedback and reporting to the students was also seen as a significant issue. As with the procedural helps, the feedback and reporting already in the computer material was judged to be appropriate and of significant value.

However, more of it, and more specifics in it were strongly recommended. Students and teachers should be aware of thresholds for accomplishments as the students cross them. Also what specifically has been learned by individual students should be made available in report form. Pursuant to this reporting was the need for both teachers and students to become familiar with the content of the computer curriculum. The need for a curriculum "map" for each set of materials was recommended to give students and teachers a clear understanding of what is expected and what needs to be done.

Three specific procedures to be tried by the project staff were suggested by the panelists: (1) pairing students on terminals, rather than assigning only one student per terminal; (2) giving the students a better understanding of the process involved in developing computer materials by giving them intentionally "buggy" programs and asking the students to proofread the programs and find the bugs; (3) experimenting with the length of sessions to determine how long Indian students should work on the computer materials at any one sitting.

2. Teacher/Computer Concerns. Most of the discussion regarding teacher/computer concerns focused on the orientation and in-service training to be provided to teachers. It was emphasized that teachers must become familiar with the content of the computer programs--perhaps by providing a "map" such as that described above. However, it was also emphasized that teachers need to be given every help possible in learning how to use the computer as a tool to support and perhaps modify their classroom procedures. Workshops prior to the first use of computers by the students were, of course,

recommended. However, the importance of continued support both in the form of off-line paper materials and frequent visits by project staff were also emphasized. Teachers need to learn how to fill gaps in the computer materials with their classroom practice and vice versa. Also, teachers need to be given full opportunity to prescribe both new and review materials on the computer for specific sets of students. A specific recommendation concerned the provision to the teachers of a monitoring program that would echo what was being displayed at any student station. This program would enable teachers to unobtrusively review progress of all their students from one central location. Finally, it was emphasized that with the trend toward contract schools on Indian Reservations, issues of teacher training are likely to become increasingly important.

3. Community/Computer Concerns. Every effort should be made to demonstrate to the community how the use of computer education will contribute to the attainment of community goals. This issue is particularly important as it applies to preserving Native cultures. The ways in which computers can help sustain culture within the value structure of the community should be articulated for the community. Existing success stories for any use of computers in Indian education should be brought to the attention of the community. It was emphasized that there are both tribal differences and community differences within and between tribes. These differences cannot be entirely accommodated by any single set of materials. But, as stated above, a demonstration that some effort has been made to address the needs of the local community should be evident. Shirley Heath's Tracton study was recommended as a source of ideas for undertaking appropriate cultural adaptations. As recommended above, off-line support

material should be made available to the communities in which the computer materials are introduced.

4. Parent/Computer Concerns. Related to the issues of community/computer concerns are those of parent/computer concerns. A number of ways to reach the parents of students who would be using the computer materials were discussed. Tribal Chapter meetings and school board meetings were noted as significant. Additionally, Title IV Parent Committees were also recommended as a channel for communication with the parents. Use of educational radio stations when these are available was also recommended. It was noted in passing, that providing a meal was a fairly effective procedure in assuring the attendance of parents at orientation functions of the sort needed. Finally, and as with the first three points, the value and utility of off-line paper materials for parents were noted and emphasized.

5. Administrative/Computer Concerns. Some note was made of the impact that use of computer materials will have on school administrators, both at the school level and at the school district level. In some cases, this impact can be directly beneficial. Administrative packages designed to run on school computer instruction systems will aid school administrators in scheduling, mark reporting, attendance, maintaining student biographical information, maintaining personnel records, accounting, and word processing. However, these capabilities themselves raise issues concerning adequate backup for data and data security that must be explicitly considered by school administrators. Additionally, much of the discussion focused on the curricular impact of the computer materials and the need to coordinate what these materials will accomplish with the objectives and goals set by

school and school district curriculum specialists and administrators. The major recommendation from the conference discussion on this point was to insure that school and school district curriculum personnel be included in discussions of the scope and sequence of the computer materials and that they be thoroughly briefed, individually if necessary, on the strengths and limitations of computers used in instruction.

6. Content Specifics. During the discussions, the panelists made some specific suggestions for design and development of the computer materials. Among these suggestions were the following:

* Someone who understands the concerns of each community into which computer materials are to be introduced and who understands the problems and processes of computer education should review all relevant materials before their introduction.

* Some relief from timed responses required by some of the computer materials should be provided so that students can on occasion have time to mull over their work.

* Some of the randomizing algorithms may not be fully operational and should be checked especially as they are used in the beginning reading materials.

* Significant emphasis should be placed on minimal pairs used in the sight word identification activities of the beginning reading program to focus on items of linguistic contrast that are especially important to Indian populations.

* Context should be provided to prevent confusions such as 'use to' for 'used to' and 'could of' for 'could have'.

* Some response other than "wrong" should be selected as the audio response to students' wrong answers.

* Directions for the sentence building exercises should point out that a student need not use all the words presented to build a sentence.

* The requirement that students always select key words for the inference exercises in reading comprehension should be carefully reviewed.

* The deletion exercises in the reading comprehension materials should be reviewed to determine if the redundant structures commonly used in languages such as Navajo, will confuse the students as they try to perform these exercises.

* Different cultural styles of communication should be taken into account as context is provided for words spoken in the sight word and vocabulary exercises of the beginning reading materials.

* Entertainment relief, as provided, is desirable and appropriate and should be increased as much as is practicable.

* A math sentence building exercise should be provided that is analogous to the English sentence building exercises already in the beginning reading materials. The math sentence building exercise should use computer graphics to illustrate to the students whether or not the sentences they have created make sense.

7. Problem Solving Approaches and Real Life Skills. A great deal of the discussion centered on the possibility of using the computers to provide a true problem solving approach to learning. Reading, graphics, and mathematics should all be combined to take a problem solving approach to teaching about these subjects. It would be especially valuable to present problems that hinge on the basic life skills that are required for urban living, such as understanding transportation schedules, filling out and reading forms, minor issues of urban etiquette, etc. Videodisc based, "surrogate," field trips would also be a particularly valuable activity. However, it was recognized that development of videodisc materials of this sort is out of the range of the current budget for the project.

8. Use of Computer Features. Computer features already available in the WICAT systems, as well as those that could be included, should be considered in further development for Indian students. More extensive use of the computer audio was strongly recommended, especially in helping students acquire math vocabulary concepts. The dual language capabilities of the audio system were emphasized, and it was recommended that the capability to easily record non-English language messages and include them in the computer curriculum materials be provided to local communities. Other computer capabilities such

as the ability to animate drawings and to interface with videodisc-stored materials were also mentioned in this context.

9. Final Report Specifics. The rough draft of the final report was discussed in these meetings. Every effort was made to incorporate in the final report the recommendations that grew out of these discussions. Since these recommendations are already included in this fashion, they are not specifically listed here.

Wrap-up Consensus

In the final wrap-up discussion session, there was an effort to identify and emphasize a number of points of strong agreement. The final discussion session was limited in time, and for this reason the following list of points should not be viewed as comprehensive for the entire conference. However, they were noted as particularly important to the panelists and for this reason deserve emphasis. These points of consensus were the following:

* The importance of pre-service, in-service, and follow-on training for teachers whose students will use the computer materials was emphasized.

* The follow-on training and support that would continue throughout the school year on a periodic basis or as the need arises was seen as particularly critical.

* The need to make a visible attempt to increase the cultural relevance of the materials to the communities using them and to provide both off-line and on-line aids for adaptation was emphasized.

* Providing an authoring language such as WISE, once use of the computer materials is under way in the school, was strongly recommended. Provision of WISE would make it possible to both adapt materials to the classroom presentations of teachers and to increase the cultural relevance of the materials to the local community in which they are used.

* Simplified, comparative overviews that would act as "maps" to the curriculum materials should be prepared and made available for all of the computer materials used in the schools.

* Feedback, diagnostic reports, and links to standard measures of achievement such as grade placement and progress in standardized texts, should be included in the reporting functions of the computer materials.

* Considerable care should be taken to train those who record the audio messages for the system and to make sure that their recording is in accord with the demands of both clarity and proper pronunciation.

* The infinite potential for the use of computers in Indian schools (and other schools) was noted by the panel members and chosen for emphasis.

* It was strongly recommended that the ability of computer materials to motivate students be exploited to the fullest.

* Computer literacy training for both students and school personnel was recognized as an important area and one that should be addressed by both on-line and off-line materials introduced into Indian schools.

* Some increased effort to develop the creative and critical thinking capabilities of students was noted as desirable although this emphasis should not be undertaken to the exclusion of the drill and practice approaches already in the computer materials.

* The value of graphics and audio enhancement of the computer materials was noted and a strong recommendation was made to increase these enhancements insofar as is practicable.

* Information dissemination about the aims, procedures, and accomplishments of the project was noted as a significant and desirable activity. This information should be disseminated as widely as possible.

Panelist's Comments

In summarizing the written comments of the panelists, there appear to be five major themes that occur in these written submissions. These are the following:

1. Strengths and limitations of computers used in instruction. It was evident that over the period of the conference the panelists gained a good appreciation of both the strengths and the limitations of computers used in instruction--and especially for Indian education. This appreciation primarily grew out of the "hands-on" experience the panelists had with the computer materials and their opportunities to observe Indian children using the same materials. As can be seen from their comments, some of the panelists arrived with an open mind but with some skepticism about the value of computers used to solve the problems of Indian education. By the end of the conference the impressions of the panelists seemed to be overwhelmingly

positive. The caveat that most properly ought to be added here is that the panelists, as well as the project staff, do not view computers as the instructional device to be used in Indian education, but as a tool or an aid to help Indian educators achieve their goals.

2. The value of a problem solving approach. Much emphasis was placed on the value of computers used to bring about a problem solving approach to the curriculum areas being developed for computer presentation to Indian students. Such an approach would include applications that have practical use in the communities in which the computer materials are placed, they would deal with "real life" issues, they would extend the use of graphs and charts already in the materials, and they would incorporate both teacher and student generated problems--which, most probably, would be developed through the use of the WISE authoring system.

3. Need for multi-cultural approach. Almost all the panelists commented on the need and importance of representing the multiplicity of American cultures in the computer materials. The materials should incorporate stories that Indian children can relate to, audio to speak local languages and dialects, and locally developed curriculum materials--all of which would be facilitated by the WISE authoring system. The panelists also emphasized that the materials ought to be reviewed for cultural relevance and culturally "loaded" messages. These reviews may be undertaken by tribal experts, representatives of the community, or volunteer groups such as returned missionaries.

4. Content specifics. Many of the comments of the panelists concerned the specifics of the computer materials. Some of the recommendations from these

comments concerned further research on the best use of audio, more emphasis on visual discrimination activities, need for consistency in answer judging, need for humor, need for specific feedback, the inclusion of pictographs, the inclusion of intentionally "buggy" versions of curriculum materials, a "speed mode" to allow proficient students to skip over materials already mastered, strong emphasis on math vocabulary and use of graphics to build up this vocabulary, construction of math sentences in the same way that English sentences are constructed in the reading programs, and the desirability of regularly paced review.

5. Ongoing support. The need for teacher and teacher aid training was emphasized along with the need for ongoing support appropriate for use by policy tribal members, parents, and other representatives of the community. Two other suggestions in this context were first the provision of a newsletter to be distributed to all members of the community as well as school staff and students, and the desirability of extending the communication network base of the project to include interactions with others working in multi-cultural, and perhaps international, environments.

The verbatim written comments of the panelists themselves are attached to this document as Appendix A.

Final Word

That this conference so successfully obtained its substantive goals is due in very large measure to both the professional and personal qualities of the panelists. They came to the conference fully prepared in their professional backgrounds, ready and willing to work, and with an open-minded attitude of

helpfulness and cooperation that was precisely right. Further coordination and cooperation between those who are developing the new technologies of instruction and those who are trained and experienced in specific areas such as Indian education ought to be encouraged and continued. Specifically, the promise of computers applied to the problems and processes of Indian education seems both genuine and affirmed by this conference. It is certainly our hope that this conference and this project represent the beginning of a new day in Indian education and not simply the culmination of an interesting but short line of development.

Appendix A

Written Comments of the Panelists

Comments by Bob Chiago

1. I recommend the use of tribal experts in tribal culture to assist in the development and evaluation of materials prior to dissemination.

2. Particularly in the lower elementary grades, I recommend that "pictographs" be used to coincide with words. On the Navajo reservation, many children speak little or no English when entering school. An addition to reading, the computer can assist in teaching language. If feasible, you might consider using DoD's Defense Language Institute program and incorporate it into CAI for Native speakers.

3. I cannot overstate the need for training...on or near Indian reservations, it might be necessary to focus some attention to training para-professionals on the "how to's" of CAI...in particular, teacher-aides. I believe that all personnel using computers to assist in instruction should be diagnosed with computers. We cannot assume that they know what they teach.

4. In the math portion that I reviewed, I seemed to notice that there was some inconsistency in what was correct and what was not. It seemed that in some cases an answer was not correct if it wasn't reduced to its lowest terms and sometimes it was correct if it wasn't reduced to its lowest terms (fractions).

5. I perceived the need for more feedback when a particular unit was completed rather than x amount of y amount correct. As with anything, too much of a good think can become monotonous. I recommend some diversion in all

lessons, i.e., division should include addition problems, subtraction should include addition, fractions should include multiplication, reading should include mathematics, and mathematics should include reading. All programs should contain elements of humor. Most eductional programs can afford humor.

6. With respect to relevancy, the problem solving should show more practical use, i.e., counting sheep, dividing food, reading letters, etc.

7. I recommend that the educational program include "bugs." Part of the instructions would be to identify these "bugs." Some of the bugs should be intentional, while others might be limitations or plain mistakes.

8. I recommend a speed mode in order to skip to more difficult parts of a lesson for purposes of review.

9. Some thought should be given to educating policy makers about the potential of CAI. I would suggest that the following on the Navajo Reservation be contacted:

    1. Navajo Area School Board Association.....c/o Vern Duus
    2. Navajo Division of Education....Mary Helen Creamer
    3. Navajo Tribal Education Committee
    4. Navajo Tribal Chairman
    5. Public School Districts in Arizona and New Mexico

Comments by Douglas Garbe

The group made general comments which were written down by Dexter Fletcher. I agree with the comments that were given.

I see an exciting new dimension open to the teacher and the student in the use of the WICAT System with its audio and visual displays. If handled correctly it can motivate both teacher and student. I have some fears that there will be more misuse of it than should be the case, much the same as with programmed instruction and the so-called "modern math." With misuse and the tendency of people to react quickly, a potentially invaluable aid to education could quite easily be discarded and looked at as another educational "boo-boo" resulting from jumping on the "bandwagon."

I feel it must be an aid and not the instructional device. The teacher must be in control of all things. Make certain teachers are educated in the proper use of the computer and see its proper place in the education process. This instruction must be ongoing and not just a short term intensive three day introduction.

Let me now be specific as to strengths I see in the system and suggestions I feel would improve the present system.

In my experience with young (or even older) Indian students I don't feel they have a conceptual understanding of whole numbers, fractions, or decimals. I believe the visual displays on these concepts are excellent. Most teachers do not take the time or are not trained to visually display these concepts

as well as the computer graphics can. What is there is excellent, but enlarge on these concepts by showing various new configurations and branch to greater complexities. Insert exercises on math vocabulary into the program so that as in the early reading program 3, 4, and four are all related by the student. Stress the words associated with the symbols. In fractions, work up exercises to associate three-fifths, $\frac{3}{5}$, and 3/5 and . There is much more I could say and more examples I could give, but I hope the idea I am trying to convey is understood. Make sure the audio is used in making certain when four is spoken the student can write 4, and draw a pictorial representation. The similar tning with 3/5, etc.

Vocabulary in mathematics must be a natural integrated part of the instruction. The program must result in a student's ability to relate the word "sum" with the word "plus" or "add" and with problems of the type 3 + 5, etc. Also my research has revealed that Indian (American) students have a difficult time distinguishing between words like "sum," "sun" and "some." Build exercises of this type within the system.

I was fascinated by the creative aspect of being given words (in the reading program) and asked to construct sentences from them. I would suggest that in math a student be given (8, is, sum, 2, product, of, 10, the, 4) and asked to create math sentences. For example:

The sum of 8 and 2 is 10.

8 is the product of 2 and 4.

etc.

Another type of exercise that could be very useful to show that a student reads a meaning into symbolic expressions is to ask students to choose or write out

a sentence in words that states what 70 ÷ 5 = 14 means--e.g. 14 is the quotient of 70 divided by 5; 70 divided by 5 is 14; etc.

Creating story problems pertaining to pictures they see or graphical displays would be a valuable exercise for all students. There seems to be no finite limit to the creative aspect that could be accomplished with the visual and audio capabilities of the system. (WISE allows teachers this creative ability.)

Most of the math programs you now have for student use are drill oriented. This is important, but vocabulary can easily be taught. (By necessity it must be taught to the Indian students because they are not now getting sufficient training in this area.) Make the vocabulary basic to the concepts taught. Don't over emphasize it so that students may feel mathematics is only vocabulary.

One last comment is to incorporate into the lessons some review questions from past lessons. This is a must in mathematics.

I am looking forward to seeing positive results from the WICAT program.

Comments by Jean Mead

1. This conference. Thank you for a marvelous opportunity to preview an exciting new learning/teaching tool and to discuss the implications of its entry into the school system with a diverse group of people. It certainly has given me a lot to think about before our school tries to deal with it. I wish this opportunity could be extended to more people. I feel very privileged. THANKS.

2. About the WICAT System. Again, thanks. In a very short period of time it has eased many of my worries and misconceptions about computers. I am no longer intimidated by these kinds of machines. I had no idea that they were so "straight forward."

3. The curriculum you are developing. As a content subject teacher who is pestered to teach basic skills, but is deathly afraid to attempt it, thanks again. I think the computer can do it much better than I can, but I also feel, after my short exposure to your curriculum much more capable of trying it. I think this will directly benefit my students before we ever get computer assisted instruction in our school. I am not a critic. Rather, I have a tendency to expand on ideas presented and can see all kinds of possibilities for addressing some specific needs I have seen in our students at Rock Point.

In the area of Math:

1. I appreciate the help feature that is incorporated within your system. Seems that the computer's patience is infinite.

2. I can see all kinds of potential in the area of problem solving. As I have mentioned before, our students, for the most part, but certainly not 100%, seem to do very well in basic computation. But, they can't apply the processes of addition, subtraction, multiplication, division to solving their own problems. Math does not seem to have anything to do with life. To combine the features of reading, graphics, and audio to help students solve problems intrigues me. The ability of the computer to present story problems in words, ask the students to translate into numbers and then to graphically portray the processes involved I think would help greatly. I would like to see students be able to generate their own problems and then work them through on the computer. I would like to see lots of consumer math. I would like to see math puzzles thrown in after mastery of skills to help students see how many different ways all these things relate to one another.

3. I like very much the reading of graphs and charts and tables of measurement. These, combined with the graphics potential can really bring math alive.

Reading:

1. Again, I think the applicability of the computer to the aquisition of basic skills, thus freeing the teacher up for creative and critical thinking, cannot be overemphasized.

2. In previewing some of the stories and articles, you have a nice blend of people stories, science, social studies, etc. I was a bit concerned on some though, that "my" students could not relate to the topics. Having

done quite a bit of substituting for reading teachers, I really enjoy discussing with the students the content of the stories. The world that we are not familiar with is fascinating. However, I have been criticized for not teaching reading skills and spending too much time teaching the students how to dig snow caves or throw boomerangs. Again, the graphics potential could easily assist. I watched one Indian student reading a story about a cheetah and a gazelle. Could the help button, on these stories when they are introduced, simply show a picture of a gazelle and cheetah with the names below? Seems that would suffice and not fall into the trap that I usually do of going on and on and on about Tarzan and relative speeds of different animals and adaptive coloration, etc.

3. You mention in your introduction to the final report that (p. 17) the purpose of reading comprehension programs are to assist students in linking textual data to pre-existing knowledge structures. There have been lots of materials developed for Native Americans by Native Americans that could be drawn upon for subject material.

4. I am also intrigued by the possibilities of using computers to actually help students acquire proficiency in SPEAKING a second language. Often, Native American students learn English from those who have a very limited grasp of the language themselves and this helps perpetuate language problems. With the audio capabilities for improving oral reading and pronunciation.....

Learner Profile

Again, thanks. This can help overcome several of the constraints our students find with the trauma and basic drag of our twice yearly three days of CTBS

testing necessary to secure funds to continue our programs. With this, also, I have not a lot of criticism, but see many, many possibilities.

Comments by Rush Sumpter

My evaluation of the WICAT program is generally favorable. In other words, I am convinced that CAI materials developed by WICAT for use in schools with high density Indian populations can be used successfully with the populations they are designed to serve. Therefore, the specific suggestions which follow should be considered as recommendations to improve or to refine a well-conceived system. They should not be construed in any way as suggestions as to why the system will not work or why the developers should not be encouraged and supported in the task they have set themselves.

With these introductory remarks out of the way, let me address some specific concerns I have about the reading instruction:

First, I recommend that all lessons be screened for grammaticality and Native-speaker authenticity. For example, although a sentence like

1. *Mary catches a fish.

appears to be a grammatical utterance, I cannot conceive of a situation where a Native speaker of English would utter it. Acceptable alternatives would be:

2. Mary is catching a fish.

3. Mary caught a fish.

4. Mary catches fish.

All of these are grammatical in the sense that they are apt to be spoken in appropriate contexts by native speakers. Sentence 1 and other sentences which sometimes appear in reading primers are not. The list of ungrammatical utterances which occur to me now include:

5. *A book is on the table.

compare 6. There's a book on the table.

or 7. It's on the table.

8. *See Dick run.

compare 9. Look at Dick. He's running.

This issue is important to me because I believe the rewards of learning are intrinsic. Therefore, people learning to read do so because they seek information or entertainment or both. When they obtain these objectives the effort to break the written code is rewarded and the desire to read is motivated. All instructional materials, therefore, ought to be instructive and/or entertaining. When we simplify the instructional materials we should never do so at the cost of meaning. Meaning should be retained.

Connected with this discussion is a second point. That is the point that some of the reading instruction--even in the earliest stages--should foster creative/critical thinking. Even pre-school and kindergarten children can consider what verbal utterances mean to them. Some non-Anglo-Saxon cultures may naturally encourage such thinking better than our dominant society. I'm thinking now of the Trackton study done by Shirley Boyce Heath. Her findings in Trackton seem relevant here.

Third, although the audio-visual capabilities of CAI seem fortunate strengths of the WICAT System, I feel some further research should be undertaken to determine whether the audio track should pronounce words in isolation or in a context or both. Furthermore, research should be undertaken to determine if words in isolation should be pronounced carefully or colloquially. I believe both options offer some advantages and disadvantages. For instance, at one

point on the audio track of is /əv/. This is a colloquial pronunciation. The children can see this word spelled as they hear it. But that may tend to foster the confusion in spelling which I find in my papers written by Indian freshmen who write could of rather than could've or could have. To conclude this point, I feel the audio-visual instruction of CAI can be well used to teach distinctions of frequently confused words such as they're, their, there; too, to, two (notice that too is always stressed; thus the vowel is always pronounced /u/. Whereas to is never stressed in casual speech; thus it is always pronounced /tə/. The pronunciation facts are reflected in the spelling. Another spelling problem many Indian students have as they enter college is a result of juncture between used and to in expressions such as "He used to like rodeos." Here the final d of used is assimilated to the initial t of to and is never pronounced. Therefore, most Indian freshmen will write used to in such contexts. The CAI approach of the WICAT System could readily be adapted to help students with such spelling confusions which have drastic sociolinguistic implications.

Fourth, I believe better and visual discrimination instruction should be enriched to include more difficult discrimination. These discriminations should include choices between S and Z, H and A, E and Ǝ, M and W, etc.

Finally more should be done in the SIID component to familiarize students with other spellings of similar sounds and hononyms. Thus use of minimal pairs--par, jar, car, etc. is very good here. But I would like to see an effort made to help students learn more than one way to spell a sound. For instance, /E/ is frequently spelled -eC in English (e.g. bed, led, Ted, etc.), but /E/ can also be written -eaC in words like bread, lead, read, etc. Note also -eaC also represents /i/ in English pronunciation as well. Again, the

coupling of audio and visual instruction with rapid feedback can be one of the most efficient means of helping students to make these distinctions in English. The Open Court reading program and Richard L. Venezky's The Structure of English Orthography can be helpful sources to assist program developers through this sound/orthographic quagmire.

Comments by V. Lynn Tyler

1. Peer reviews (with aid of teachers, parent-tutors as appropriate) will help identify cultural, procedural, personal deterents to effective CAI-regular-curriculum developments. Correlate: Positive developmental ideas and procedures also accrue from these when regularly programmed.

2. Attitude adjustment where negative concerns are felt about CAI (e.g. WICAT programs) is most readily resolved before CAI is undertaken. Local success stories (even generated for the occasion) do more to solve challenges of people-machine-empathy than trying to resolve this dilemma after CAI is underway!

3. Attached list of "Keys for Synergic Interaction and Outcomes applies to those who maintain balance between users and computers. Though this may seem more human relations focused, the outcomes depend on teachers/ students having the character traits developed so the "machine" is not overbearing. In essence: HUMAN RELATIONS should take precedence. There is best learning when it is WITH instead of about or for: team efforts.

4. A communication system (newsletter-type?) can regularly inform and invite sharing of "best ideas" and successes. There is a tendency in isolated use areas to feel problems are unique, and that success may only be "good luck."

5. Some forms of semantic check would likely be productive as programs develop (soft-ware). That is, ambiguities, inferences, linguistic markers of

emotive "bombs" can be tested more easily as programs are written than when they are regulation. Eg: use of "good" or "yes" or impersonal "we," or "you." All words are culturally loaded. To reduce the risk of misunderstanding at the point of initiation is quite cost effective--given a few rather simple clues: universal names (e.g. Biblical/popular) and non-humanization of animals and objects--except in quotes, non-verbal clues (does a smile really indicate pleasure or approval?), colors--which have varied impact, etc. (See Tyler, et al. Inter Cultural Ready Reference.)

6. Extend your resource/networking base: Unesco, Globel Perspectives, Newsletter, Ethnic Studies Groups, etc.--lst to lend greater credibility to your research but also to identify other potential users, validators, refiners.

7. Invite volunteer groups--returned missionaries--particularly those who have worked in "Welfare Services" or with educational programs to occasionally review your developments (via Multi-Cultural Studies, BYU, U of U, etc.) There are volunteers ready to give helpful feedback.

8. Problem solving and decision making take many forms--many of which are not Anglo-Western. I recommend you try Edward DeBono's approaches as a reasonable base for further developments. His program would seem to have major significance for both the Indian CAI and WICAT overall.

Some Guidelines from
Intercultural Studies—
— Meeting Challenges in
Planetary Initiatives
(People-with-People!)

KEYS FOR SYNERGIC INTERACTION & OUTCOMES

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1. Constantly developing and universally practicing what the Japanese call *OMOIYARI* (empathy + esteem for all other people, embodying willing mutual support) to the point of *SHIBUI* (beauty and harmony that is noticeably unnoticed, *understated*, never proclaiming itself nor offending the senses). Such a gift readily accepts cultural uniqueness appropriately.
2. Determining and overcoming *ILLUSIONS* of mutually acceptable interaction. It must BE, not seem!
3. Friendshipping! (Who can I teach, from whom can I learn best...but my friends?)
4. Working through positive ego/ethno-centrisms of (your/their) value and change — satisfactorily dealing what what is "wrong" or "right"...especially when neither may exist: only difference.
5. Strengthening other people in their "religion" -- that is how they use, maintain and repair their own character (habits of thought, feeling, and behavior) as it enhances, not impedes.
6. Applying continuous discoveries of what already has been tried (and why and how it succeeded or failed somehow) before seriously initiating and developing new programs to solve old problems.
7. Obtaining significant support to do what is essential in order to resolve peoples' concerns, obstacles, and dilemmas -- especially when these may still to be fully understood/appreciated.
8. Seeking and crediting all willing sources of counsel, guidance, and assistance (human and Divine).
9. Appropriately catalyzing the use of sound ideas and sharable resources. (Sound judgment and human development depends so much upon valid, reliable, effective and balanced data, as it combines with agency, diligence, accountability, and mutually beneficial experience, insight, and training. Such consistently involves understanding and properly using "powers that be.")

   As one lamp lights another, nor grows less, so goodness shared expands to enlighten all.
10. Resolving, with those involved and affected, that which (in terms of predispositions and real expectations) is significant...prior to making or implementing, with courtesy and respect, any and all critical decisions.

    The head may hardly comprehend what the heart has not considered, for the heart feels today what the head learns in its yestermorrows. Feel and think before action reveals meaning!

For SYNERGY rather than unprofitable DYSERGY to occur, all of the above principles and practices need:

A. Willingness to sacrifice that which is less for that which can be greater, making time and resources available while placing others' lasting needs in appropriate priority with one's own. Sharing is insistent interdependence vs. selfishness which belittles or destroys. (This is realistic altruism.)

B. Setting the stage: assuring all concerned are as ready as possible for coming events/impressions.

C. Listening with CARING. *Swift to HEAR, slow to SPEAK, as somehow slow to WRATH.*

D. Vocalizing feelings with propriety; consistently coping with silence that isolates or alienates.

E. Allowance for room to grow, make mistakes, and refine: avoiding unnecessary or inappropriate judgment, criticism, or other delimiting exercizes in frustration.

F. Maintenance of confidence which has been developed through trust that is shared, and reconciled differences that make a difference to personal feelings and committments.

G. Practice of patience and forgiveness (even for us mortals who want it NOW, or else!). Things take time!

H. By voice, tone, feeling, glance, mannerism, and total personality -- sharing what is valuable to and for all, learning to understand and wisely building upon what counts most over time and trial.

Contributors to these ideas include Marvin J. Ashton, Chauncey Riddle, L. Robert Kohls, and myriad writers and students of affective interaction principles and practices. Please note below any ideas you feel should refine the above or become part of this "mapping" of people-centered study and application. Thanks!

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Comments by Henrietta Whiteman

On the morning of June 28, 1983 I was totally ignorant about computers and intimidated by their technological advances and a certain dehumanization they appeared to represent. I knew even less about computer-aided instruction. Because of my commitment to and work in education, however, specifically Indian education, I consented to attend the Indian Conference on CAI.

I approached the meeting with an open attitude and objectivity. Orientation to the project consisted of background information on the program and more important "hands-on" experience in CAI. I realized that the machine could be a patient friend and is an innovative teaching strategy.

Actually sitting at the computer and drilling in mathematics provided me with immediate, personal experience in the mathematics curriculum. A strength of the curriculum is its flexibility and individualized instructional mode. Just as it was in tribal-specific cultures, the child could learn and progress at his/her individual rate of development. Moreover, the child has to develop certain competencies before advancing to more difficult and complex exercises. The key, however, is the manner of learning mathematics in a totally different educational setting that appears to make learning fun.

I worked only with the more elementary levels in mathematics of which there was a diversity reflecting various levels. Addition, subtraction, division, and whole numbers presented no problems. Multiplication of two and three digit

numbers, however, resulted in my "escaping" the exercise because I was attempting to figure out the problem mentally. I learned later that students were allowed to use paper and pencils to figure the answers. This instruction should appear in the directions or be explained prior to working in multiplication. Some concerted effort should be made to allow for practical application of the knowledge and skills mastered.

The "hands-on" experience in reading was another rewarding situation. Despite my background in English, I was stimulated more by the mathematics drills. It may have been caused by the fact that I failed my first reading exercise in word recognition. As instructed by the warm although directive voice I spelled Lip which I heard. I discovered later that I should have spelled Lit. The exercises served as excellent drill exercises but should be utilized strictly as "drill" and reinforcement activities. My serious concern is with the content of some of the exercises. They should reflect the multiplicity of American cultures, all from a positive point of view. This should be the case in particular for ethnic groups and specifically for American Indian tribal groups.

Even more gratifying was my observation of the Indian children at the computers. They were keenly motivated to learn. They were excited. They were enthusiastic. More important as apparent from the "happy faces" indicating a correct response, they were learning. Based upon an observation of one rather unfortunate incident, which I would say was not typical, the teacher has to make certain that a child does not engage in activities beyond his/her capabilites. This could cause frustration or resentment of an innovative learning tool.

Heretofore, American Indians have lived in a dual world in which they maintain their ancient and unique traditions as the native people of this country and learn that of the dominant culture. Thus, their education has to be an excellent one that is culturally based and strong in academics (basics). Now, because of time and place constraints they have to be technologically aware. All of these three can be well-integrated through CAI. Just looking at the beautiful alert faces of the Indian children, they can master mathematics concepts and become our scientists of tomorrow. Upon mastering the reading concepts they can become any professional of their choosing. In conclusion CAI is the instrument that not just teaches, but Indians can utilize to improve the quality of American Indian education. It has the potential.